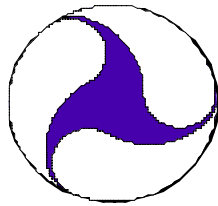**Module 1A -- Course Framework → Instructors Guide**

M1A.1: Cover Slide

Module 1A
Course Framework

......
M1A.2: Transportation Challenges in Your Area   (5 min)

What are the Transportation Challenges in Your Area?

- ◆ **Problems/Site Conditions**
- ◆ **Deployment Issues/Constraints**
- ◆ **Other**

Module 1A   **Deploying Integrated Intelligent Transportation Systems**   **2**

Delivery:

- Using flip charts for each category, solicit input from the participants under the two sub-headings and "Other".
- Try to place the "Other" into one of the two categories but use a third flip chart if needed.
- The "Problem/Site Conditions" flip chart will be used later to array ITS opportunities **(FC-1A-4)**.
- Ask specific questions of individuals if response is slow.
- Try to get 7-10 items under each category.

FC-1A-1

Problems/Site Conditions
1.
2.
3.
4.
5.
↓

FC-1A-2

```
┌─────────────────────────────────┐
│ Deployment Issues/Constraints   │
│                                 │
│ 1.                              │
│                                 │
│ 2.                              │
│                                 │
│ 3.                              │
│                                 │
│ 4.                              │
│                                 │
│ 5.                              │
│                                 │
│ ↓                               │
└─────────────────────────────────┘
```

Output:
- Flip charts covering participant input **(FC-1A-1 & FC-1A-2)**

Notes:
- This activity starts the participants interacting with each other and with the instructor
- It also provides the instructor with insight into the participants' regional transportation challenges
- Possible transportation problems/challenges include:
    - A.   Problems/Site Conditions
        - traffic congestion
        - travel delays (goods, services, personnel)
        - delays at highway toll plazas
        - environment
        - pollution - air quality - reduce fuel consumption and vehicle emissions
        - incident management
        - transit schedule adherence
        - "just-in-time" delivery schedule adherence
        - public safety problems
        - motor vehicle crashes (auto, truck, bus, etc.)
        - accidents involving pedestrian
        - at grade-railroad crossings
        - red light violations
        - providing real-time traffic and transit information to travelers, traffic managers, transit operators, and businesses that transport people and goods
    - B.   Deployment Issues/Constraints
        - lack of communication among transportation agencies
        - providing the workforce transportation to their jobs
        - funding the regional transportation system
        - expense of operating and maintenance costs
        - inefficient operation of systems

- opportunities to generate revenue (congestion pricing, tolls, right of way)
- economic development climate hindered by congestion
- no political buy-in from decision makers
- technical obsolescence

M1A.3: "Smart Moves" Video   **(15 min)**

Smart Moves Video

- ◆ **Presents the benefits of ITS**
- ◆ **While you watch:**
  - ✦ **Note problems**
  - ✦ **Note solutions**
- ◆ **How does this compare to our lists?**

Module 1A   **Deploying Integrated Intelligent Transportation Systems**   **3**

Delivery:

- Before showing the tape, ask the class to note as they watch the tape
  - If any of the problems on the class's top 10 list are mentioned
  - If problems **not** on the class's top 10 list are mentioned
- Show the tape to the class --> the tape shows the use of Intelligent Transportation Systems by several municipalities to address their transportation problems
- Facilitate a discussion of the tape
- **ASK**:
  - "How do the problems mentioned on the tape compare with the top 10 listed by the class?"
- **ASK:**
  - "What solutions were provided ?"

Output:

- N/A

Notes:

-

M1A.4: What is ITS ?   **(4 min)**

What is ITS?

Module 1A   **Deploying Integrated Intelligent Transportation Systems**   **4**

Delivery:

- Ask participants to define "Intelligent Transportation Systems" in their own words and instructor lists them on a flip-chart (**FC-1A-3**).

FC-1A-3

Your definition of ITS
•
•
•
•
•
↓

Output:

- List of participants' definition of ITS **(FC-1A-3)**

Notes:

-

What is ITS?

◆ **The application of sensor, computer, electronics, and communications technologies and management strategies in an integrated manner - providing traveler information to increase the safety and efficiency of the surface transportation systems**

Module 1A   **Deploying Integrated Intelligent Transportation Systems**   **5**

Delivery:
- Show the "textbook" definition of ITS
- Ask participants to read definition
- Ask them to comment on the definition
    - What would you add or delete?
- Break down the definition elements and give brief examples (as in the ITS Awareness Seminar)
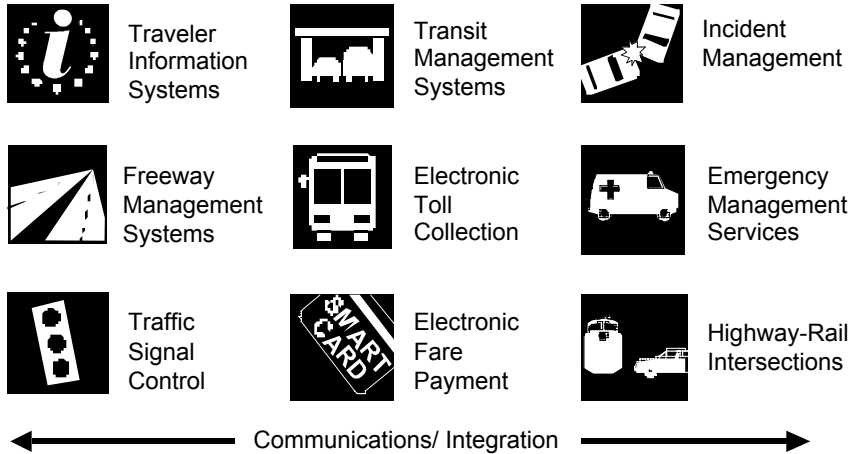- Identify similarities between the "textbook" and participants' definitions

Output:
- N/A

Notes:
-

Metropolitan ITS Infrastructure Components

Traveler Information Systems	Transit Management Systems	Incident Management
Freeway Management Systems	Electronic Toll Collection	Emergency Management Services
Traffic Signal Control	Electronic Fare Payment	Highway-Rail Intersections

◄——— Communications/ Integration ———►

Module 1A   **Deploying Integrated Intelligent Transportation Systems**   **6**

Delivery:

- Present the ITS infrastructure components in general --> each will be discussed during subsequent slides
- The components provide the basis (infrastructure) for a regional transportation system
- They are interrelated --> if they are integrated and operated in a coordinated fashion the result will be a powerful regional transportation system
    - *This requires the exchange of information between agencies!!*
- The components, and ITS in general, should be considered as an integral component in any transportation solution
- ITS is <u>not</u> exclusive of other solutions!!
- Note that the ITS infrastructure components also apply to selected rural conditions but with a different emphasis
- Note that the role of communications and the need for integration are common to all components
- **ASK**:
    - "What other examples do you have?"

Output:

- N/A

Notes:

-

Traffic Signal Control

TSC

Module 1A   **Deploying Integrated Intelligent Transportation Systems**   **7**

Delivery:

- Traffic Signal Control Systems
  - Utilize central and field equipment to monitor traffic conditions on arterial streets and control traffic on intersections with traffic lights
  - Field surveillance equipment includes vehicle detectors and video cameras and control equipment includes intersection controllers
  - Central equipment includes computers, workstations, networks, monitors, and consoles
- Examples of integration with other components:
  - Emergency vehicle preemption
  - Transit priority
  - Freeway/arterial coordination
- Add personal examples (as appropriate throughout this entire section)
- This slide has been previously covered in the ITS Awareness Seminar --> therefore, some of you have already seen this one and subsequent slides
- "Should" be used:
  - Urban core
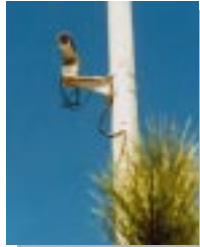 - "Satellite" activity centers
  - All arterials

Output:

- N/A

M1A.8: Freeway Management (1 min)
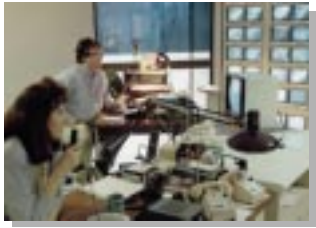
Freeway Management Systems

FMS

Delivery:
- Freeway Management Systems
  - Utilize central and field equipment to monitor traffic conditions on highways, control traffic entry by metering ramps, and control motorist's behavior with highway advisory radio and variable message signs
  - Field surveillance equipment includes vehicle detectors, video cameras, weather stations and control equipment includes ramp controllers
  - Central equipment includes computers, workstations, networks, monitors, and consoles
- Examples of integration with other components:
  - Coordinated diversion strategies due to an incident
  - Freeway/arterial coordination
  - Ramp metering priority (transit and emergency vehicle)
- Covered in the ITS Awareness Seminar
- "Should" be used:
  - All congested freeways
  - Freeway sections with high accident rates
  - Heavily traveled freeway sections near "event generators"

Output:
- N/A

M1A.9: Transit Management **(1 min)**

⬟ **Transit Management Systems**

▣ TMS

Delivery:
- Transit Management Systems
  - Utilize central and field equipment to monitor, track, schedule, and operate transit vehicle fleets
  - Provide real-time information to travelers concerning transit routes, schedules, and on-time performance
- Note wide variety of applications based upon specific scale and nature of transit system
  - Automated Vehicle Location (AVL) systems
  - Automated Passenger Counting (APC) systems
- Vehicle on-board diagnostic systems
- Examples of integration with other components:
  - Transit priority system (arterial and ramp metering)
  - Traveler information distribution
- Covered in the ITS Awareness Seminar
- "Should" be used:
  - All transit properties where service improvements are clearly justified and economically feasible
    - "Full" systems for larger transit properties (say 200 units), rural systems requiring real time scheduling, etc.
    - Maintenance and safety related systems for smaller properties

Output:
- N/A

Incident Management

IM

Module 1A   **Deploying Integrated Intelligent Transportation Systems**   **10**

Delivery:
- Incident Management Systems
  - Utilize central and field equipment to detect, confirm, respond, clear, and manage incidents, manage traffic, and distribute incident information
- Examples of integration with other components:
  - Electronic connection to the EMS' 911 System
  - Incident diversion strategies tied into freeway/arterial management systems
  - Traveler information distribution
- Covered in the ITS Awareness Seminar
- "Should" be used:
  - Along all major freeways --> especially those corridors with heavy congestion and high accident rates
  - Freeway and arterial roadway sections near "event generators"

Output:
- N/A

Notes:
-

M1A.11: Electronic Fare Payment (1 min)

Electronic Fare Payment

EFP

Module 1A **Deploying Integrated Intelligent Transportation Systems** **11**

Delivery:
- Electronic Fare Payment Systems
  - Allows the integration of transit fare systems including: debit, credit, and stored value cards
- Examples of integration with other components:
  - Central processing system --> the same card could be used to pay fares and parking fees and could also be used for multiple applications
  - Integration with other transit operators, human service providers (welfare to work programs), and emergency possibilities with stored value bank cards
- Covered in the ITS Awareness Seminar
- "Should" be used:
  - Major transit agencies/routes
  - Transit systems with employer/public agency subsidy
  - Parking lots (especially those in the urban core and near event generators)

Output:
- N/A

Notes:
-

M1A.12: Electronic Toll Collection (1 min)

Electronic Toll Collection

ETC

Delivery:
- Electronic Toll Collection Systems
    - Allows the payment of tolls electronically
    - This includes roadside and in-vehicle cards or tags, and a communications system between the vehicle and the roadside
    - Toll payment is processed as the vehicle passes the toll station
- Examples of integration with other components:
    - Electronic tie with a bank to process payments and credit balances
    - Use to pay parking fees at garage
    - Use to purchase food and gasoline
    - Probe vehicle information for traffic management
- Covered in ITS Awareness Seminar
- "Should" be used:
    - All toll roads, turnpikes, toll bridges, etc.
- Being readily adopted by agencies and accepted by users
- Good place to note privacy issue versus convenience

Output:
- N/A

Notes:
-

M1A.13: Highway-Rail Intersection Safety   (1 min)

Highway-Rail Intersections

HRI

Delivery:
- Highway-Rail Intersection Safety Systems
    - Adequately warn drivers of crossing hazards using automated systems
- Will eventually support real-time information on train position and estimated time of arrival at Highway-Rail Intersections (HRI), real-time roadway traffic conditions at Hrs, pro-active train control by train control centers, interactive coordination between roadway Traffic Management Centers, Transit Management Centers and train control centers
- Example of integration with other components:
    - Connection to Traffic Signal Control System, Transit Management Center, and Rail Management System to access the information necessary to provide warnings to motorists
- Covered in the ITS Awareness Seminar
- "Should" be used:
    - In simpler form, highway-rail intersections
    - More sophisticated form, where corridor impact is a continuing problem

Output:
- N/A

Notes:

-

Emergency Management Services

EMS

Module 1A   **Deploying Integrated Intelligent Transportation Systems**   **14**

Delivery:

- Emergency Management Services
  - Efficiently and safely manage emergency vehicles
  - This includes tracking, dispatching, and routing the vehicles
- Examples of integration with other components:
  - Emergency vehicle preemption (arterials and ramp metering)
  - Coordination with Incident Management teams
  - Traveler Information provided by dispatch center
- Covered in the ITS Awareness Seminar
- "Should" be used:
  - Along all major freeways --> especially those corridors with heavy congestion and high accident rates
  - Freeway and arterial roadway sections near "event generators"

Output:

- N/A

Notes:

-

M1A.15: Traveler Information Systems (TIS)   **(1 min)**

Traveler Information Systems

TIS

Delivery:

- Traveler Information Systems
    - Collect traffic and transit information from transportation agencies, consolidate the information and distribute it to travelers, traffic managers, transit operators, and other interested public agencies or private firms
    - Distribute the information using radio and television broadcasters, kiosks, highway advisory radios, variable message signs, in-vehicle devices, telephone advisory systems, pagers, watches (Seiko), the internet, and cable TV
    - May be operated by a public agency, private firm, or a private/public partnership
    - If operated by a private firm, information is re-packaged and marketed --> a private firm may also collect information with its own surveillance equipment (e.g., video cameras)
- Examples of integration with other components
    - Gather information from all of the other infrastructure components and distribute it to the motoring/consuming public
    - Automated access of TMS/transit schedule adherence information
    - Freeway travel time information from an FMS
    - Accident information (e.g., locations, duration, etc.) from IM
    - Offers "real" public/private partnering opportunities
- Covered in the ITS Awareness Seminar

- Application in rural areas include significant incidents or closures, construction projects, and weather information (Note- weather related conditions are seen as especially important to rural travelers)
- "Should" be used:
  - Everywhere (to the greatest extent possible)

Output:
- N/A

Notes:
-

Telecommunications

- ◆ **The element that facilitates integrating the ITS infrastructure components into a regional transportation system**
  - ✦ **Information sharing**
- ◆ **Integration is the desired result, communications provides the "glue"**

Module 1A **Deploying Integrated Intelligent Transportation Systems** **16**

Delivery:
- Communication technologies are necessary:
  - To exchange information within each of the infrastructure components
  - To exchange information necessary to integrate and operate the infrastructure components in a coordinated manner
  - Communication technologies and services are developing very quickly
  - As the unifying structure between subsystems within the National ITS Architecture --> telecommunications are a "key" component
- An agency must decide whether to build its own communications network or lease services from a communications provider
- It's possible to exchange right-of-way for communication services
  - This is an oversimplified statement about a very complex and unfolding problem. The recent "Telecommunications Act" has removed some state and local flexibility on this issue and the rules differ significantly in different state jurisdictions. This issue is a course in and of itself.
- Physical aspect that represents institutional "willingness-to-share-information"
- Covered in the ITS Awareness Seminar

Output:
- N/A

Notes:

-

How Does ITS Address Problems/ Site Conditions?

◆ **Match the components with the "Top-10" challenges**

Module 1A   **Deploying Integrated Intelligent Transportation Systems**   **17**

Delivery:

- Use flip-chart **FC-1A-1** with the "Problems/Site Conditions."
- Place a chart on the right of it with the 9 ITS infrastructure components listed across the top (use common acronyms- TIS, FMS, TMS, TSC, IM, EMS, ETC, EFP, HRI) **(FC-1A-4)**

FC-1A-4

Top 10	TSC	FMS	TMS	IM	EFP	ETC	HRI	EMS	TIS
1									
2									
3									
4									
5									

- Step the class through 5 or so of the key "Problems/Site Conditions" and ask students to indicate which of the 9 ITS infrastructure components might help provide a solution to each --> indicate this on the flip-chart with check marks
- The ITS Awareness Seminar covers similar material

- In most cases, several components will apply to each challenge
  - *For example, Traffic Signal Control, Freeway Management, Incident Management, and Transit Management all help to address the challenge of traffic management for major events*
- This exercise should make participants aware of the many ways in which ITS should be considered as an integral part of any transportation solution
- This activity begins to illustrate why integration and coordinated operation is important to provide transportation solutions

Output:
- A mapping of the 9 components (ITS solutions) to the "Top 10" challenges **(FC-1A-4)**

Notes:
- This exercise will become repetitive after a few problems. Stop at the point when several solutions are often applicable, highlighting the need for coordination and integration.

M1A.18: National ITS Architecture   **(3 min)**

National ITS Architecture

- ◆ **A unifying framework that enables ITS infrastructure components to share information and function as an intermodal transportation system**
- ◆ **Documents stakeholder consensus regarding**
  - ✦ Current information sharing needs and future opportunities
  - ✦ Data descriptions, processing specifications, and process flows
  - ✦ Subsystem definitions, functionality, and standard interface needs
  - ✦ Telecommunications options for subsystem inter-connections
  - ✦ Potential institutional roles, responsibilities, and relationships

Module 1A   **Deploying Integrated Intelligent Transportation Systems**   **18**

Delivery:

- National ITS Architecture "History"
  - ITS America recommends that DOT initiate an ITS Architecture program
  - FHWA program to develop a framework to deploy and integrate ITS
  - Selection of four competing teams, then downselect to two for consensus architecture
  - Peer-review by ITS industry experts to select the "best" approach
- Why National ITS Architecture is important to ITS
  - Maximizes value of investments
    - Provides common starting points
    - Supports ranges of functionality
    - Institutional flexibility/local choice
    - Can save local transportation agencies time, money and effort
    - Provides a roadmap to design
    - Open systems and standard interfaces
    - Multiple suppliers/competitive markets
    - Future growth
    - Reduce risk and cost
    - National compatibility, synergy and integration

Output:

- N/A

M1A.19: Relationship Between the National ITS Architecture and the Nine (9) ITS Infrastructure Components   (2 min)

Relationship Between the National ITS Architecture and the ITS Infrastructure Components

Architecture Subsystem \ ITS Infrastructure Component	Traffic Signal Control	Freeway Management Systems	Transit Management Systems	Incident Management	Electronic Fare Payment	Electronic Toll Collection	Highway-Rail Intersections	Emergency Management Services	Traveler Information Systems
Commercial Vehicle Administration (CVAS)									
Commercial Vehicle Check (CVCS)									
Commercial Vehicle Subsystem (CVS)									
Emergency Management (EM)								x	
Emissions Management (EMMS)									
Emergency Vehicle Subsystem (EVS)								x	
Fleet and Freight Management (FMS)									
Information Service Provider (ISP)									x
Personal Information Access (PIAS)									x

Delivery:
- Review the table depicting the relationship between the National ITS Architecture and the 9 ITS Infrastructure Components
- Concept "definition" of the National ITS Architecture
    - "What is done, where it is done, and how it communicates and integrates with other pieces of the ITS infrastructure"
- Purpose
    - Ensure interoperability at all levels and facilitate integration

Output:
- N/A

Notes:
-

M1A.20: Relationship Between the National ITS Architecture and the Nine (9) ITS Infrastructure Components (cont.)   (1 min)

Relationship Between the National ITS Architecture and the ITS Infrastructure Components

Architecture Subsystem \ ITS Infrastructure Component	Traffic Signal Control	Freeway Management Systems	Transit Management Systems	Incident Management	Electronic Fare Payment	Electronic Toll Collection	Highway-Rail Intersection	Emergency Management Services	Traveler Information Systems
Parking Management (PMS)									
Planning Subsystem (PS)									
Roadway Subsystem (RS)	x	x					x		
Remote Traveler Support (RTS)					x				x
Toll Administration (TAS)						x			
Toll Collection (TCS)						x			
Traffic Management (TMS)	x	x		x			?		
Transit Management (TRMS)			x		x				
Transit Vehicle Subsystem (TRVS)			x		x				
Vehicle (VS)							x		

? = Interface had not yet been determined

Module 1A   **Deploying Integrated Intelligent Transportation Systems**   **20**

Delivery:
- Review the table depicting the relationship between the National ITS Architecture and the 9 ITS Infrastructure Components
- Concept "definition" of the National ITS Architecture
  - "What is done, where it is done, and how it communicates and integrates with other pieces of the ITS infrastructure"
- Purpose
  - Ensure interoperability at all levels and facilitate integration

Output:
- N/A

Notes:
-

M1A.21: From Idea to Implementation   **(2 min)**

From Idea to Implementation

Module 1A   **Deploying Integrated Intelligent Transportation Systems**   **21**
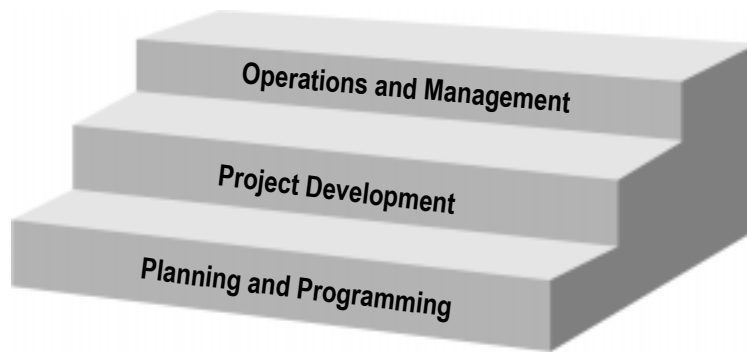
Delivery:

- Introduce idea of considering deployment in a simplified 3-step process as noted on slide
- Indicate that we will be considering integration in context of all three steps
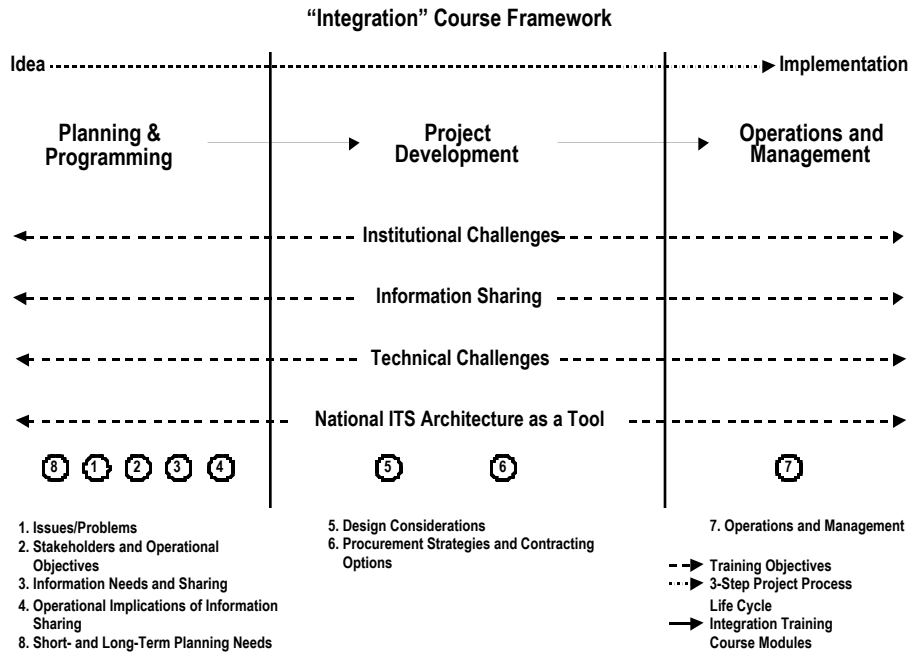- This is similar to how agencies often view project delivery

Output:

- N/A

Notes:

-

M1A.22: Integration Course Framework   (2 min)

"Integration" Course Framework

Idea ---▶ Implementation

| Planning & Programming | Project Development | Operations and Management |

Institutional Challenges ◀--------------------------------▶

Information Sharing ◀--▶

Technical Challenges ◀--------------------------------------▶

National ITS Architecture as a Tool ◀----------------------▶

⑧ ① ② ③ ④   ⑤   ⑥   ⑦

1. Issues/Problems
2. Stakeholders and Operational
   Objectives
3. Information Needs and Sharing
4. Operational Implications of Information
   Sharing
8. Short- and Long-Term Planning Needs

5. Design Considerations
6. Procurement Strategies and Contracting
   Options

7. Operations and Management

- -▶ Training Objectives
···▶ 3-Step Project Process
     Life Cycle
——▶ Integration Training
     Course Modules

Module 1A   **Deploying Integrated Intelligent Transportation Systems**   **22**

Delivery:
- Review the diagram
- Explain how the diagram relates to the course and integrating ITS
- Refer also to the "Integration Course Flow" wall chart

Output:
- N/A

Notes:
-

Let's Review

- ◆ **Identified regional transportation challenges**
- ◆ **Defined ITS**
- ◆ **Introduced the ITS infrastructure components and their integration**
- ◆ **How the infrastructures components address transportation challenges**

Module 1A **Deploying Integrated Intelligent Transportation Systems** **23**

Delivery:
- Institutional and technical regional transportation challenges
- What is ITS
- What are the ITS infrastructure components
- How the ITS infrastructure components may contribute in solving transportation challenges

Output:
- N/A

Notes:
-

Let's Review (cont.)

- ◆ **Telecommunications: The glue that holds it all together**
- ◆ **Introduced the three major steps of the project process**
- ◆ **Recognize institutional vs. technical challenges**

Module 1A   **Deploying Integrated Intelligent Transportation Systems**   **24**

Delivery:
- Communications --> the glue that holds it all together
- The 3 major steps of the project life cycle
- Institutional vs. technical challenges

Output:
- N/A

Notes:
-